Room-sized Informal Telepresence System

Mingsong Dou, Ying Shi, Jan-Michael Frahm, Henry Fuchs
UNC-Chapel Hill

Bill Mauchly, Mod Marathe
CISCO

Presented by Dr. Henry Fuchs
Mar 7, 2012
Informal Group Telepresence

Room-sized, Informal system, being on 24/7

drawn by Andrei State
Challenges: what to put on the wall

- People move
doing things differently from the videoconferencing systems

- Ideally 3D displays would give ideal views to all users, but current multiscopic technology is inadequate.

CISCO telepresence (http://tatatelepresence.com/)

Drawn by Andrei State
Our system

Build a system with current technology and standard 2D displays
What to put on a 2D display

- Give the illusion that two adjacent rooms separated by a glass window.
  - a cluster of cameras locate at the middle of the display wall.

panorama view of the room
What to put on a 2D display

- Show the life-size people when they talking at a comfortable distance.
  - doing so by matching the FOV of cameras with the size of display panel.

Life-size people shown on display

Room-sized Informal Telepresence System
What to put on a 2D display

- Incorrect eye gaze
  - especially for the display towards the edge;
  - because the camera looks at the people from the side.

Incorrect eye gaze in the panoramic view
Introduce Personal Cameras to Capture the front view of a nearby person

Problem: the camera looks at the people from the side.

Solution: adding another set of front-looking cameras
Introduce Personal Cameras to Capture the font view of a nearby person
Switch only the nearby person’s image, not background

- remove the image of the individual out of the panorama image
- add the person’s image from the personal camera to the panorama

Panorama view

Panorama view with the front-facing people
Use Depth Cameras for Segmentation

Front-facing Camera

Panorama Camera Cluster

Kinect Depth Camera

Room-sized Informal Telepresence System
Transform the segmentation results to high resolution color images

Connected Component Labeling

2D to 3D

3D to 2D

reproject 3d segmented points to the personal and panorama cameras

All the cameras are calibrated to the same world coordinates
Put all the image layers together

Fill the missing pixels with the rendering result from the 3D background points and the historic background
Make a smoother transition from panorama to personal view

Render intermediate views when switching from panorama to personal view

Project texture on the foreground point cloud
System

- Two display walls set up in UNC
  - controlled by two PCs at each site
  - runs 8 fps
Results

Room-sized Informal Telepresence System
Conclusions and Future work

- Design a system with current technology
  - Good for causal gathering;
  - offer optimized view of what happens in the other room.

- Future work
  - Segmentation could be improved
  - Hole filling algorithm could be improved
  - Human tracking for robust switching
  - Wall size multiscopic display